

SECTION 13 CONTENTS

13.1	Introduction	13-1
13.2	Background	13-1
13.3	Organizations and Regulations	13-2
13.4	Flooding Problems	13-2
13.5	Drought Problems	13-3
13.6	Other Water-Related Emergency Problems	13-3
13.7	Flood Prevention and Hazard Mitigation	13-4
13.8	Drought Reduction Alternatives	13-6
13.9	Other Emergency Alternatives	13-6
13.10	Issues and Recommendations	13-6

SECTION 13

STATE WATER PLAN - JORDAN RIVER BASIN

DISASTER AND EMERGENCY RESPONSE

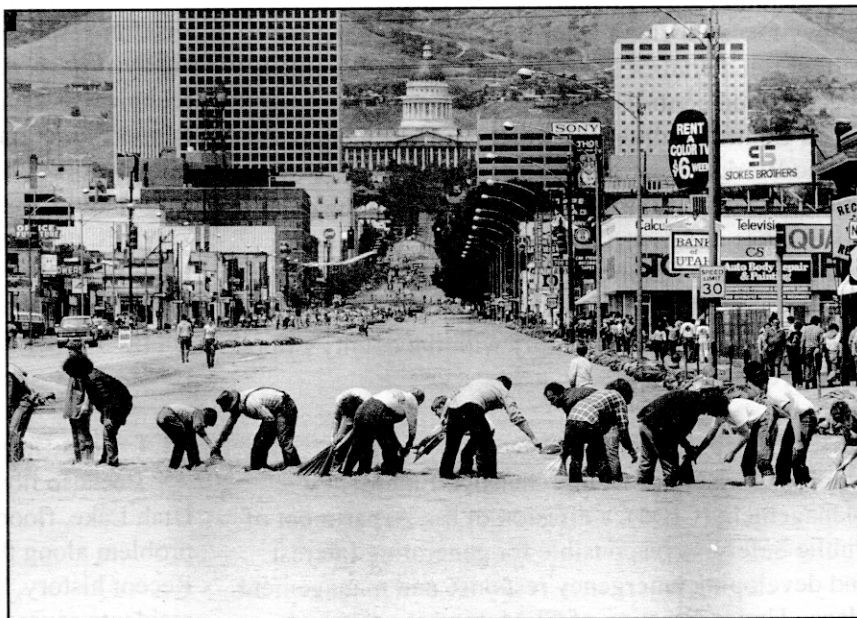
Reacting to a disaster or emergency after it has already occurred is not as efficient as pre-disaster activities, such as floodplain management, hazard mitigation and planning.

13.1 Introduction

This section discusses flood hazard mitigation and drought response. It also briefly discusses programs now in place and additional programs that could be beneficial in dealing with flooding and drought problems. The Division of Comprehensive Emergency Management (CEM) is responsible for disaster and emergency response at the state level. Many types of emergency situations are water-related, varying from disastrous flooding to extreme drought. Most disasters are naturally caused. A few, such as chemical or oil spills, are man-caused. Some situations, such as a dam failure, can have a complex combination of natural and man-made causes. When any emergency situation arises, a prearranged response plan provides a quick and effective coordinated response. Generally, the response plan emphasizes prevention of an emergency and, therefore, prevention of damages. The state maintains a hazard mitigation team to provide coordination with local governmental authority to establish measures and to lessen or eliminate the impact of a disaster. This team represents state agencies in hazard mitigation matters. The following paragraphs attempt to define the organizational responsibilities for emergency response in the Jordan River Basin, concentrating mainly on the two most common water-related emergencies: floods and drought.

13.2 Background

The history of water-related natural disasters in the Jordan River Basin includes a number of significant floods and drought events. The floods of the mid-1980s resulted in hundreds of millions of dollars in property damages to homes, businesses, public utilities and infrastructure. The extended drought years of the late 1980s significantly lowered reservoir storage levels and threatened restrictions for outdoor water use. Recent flooding and drought events experienced in the Jordan River Basin have been classified as 100-year events. Despite the tendency to believe the basin has experienced the worst case scenario, an event of equal or greater magnitude is possible. Dams and other large public utility structures are designed to withstand natural disasters that are 500- to 1,000-year events.



1983 flooding on State Street in Salt Lake City

The northern Utah region is considered a high seismic risk area. The region has numerous active faults that have been relatively quiet in recent geologic time. The last major seismic event in northern Utah occurred in 1962 in Cache Valley. It has been estimated the last significant seismic event in the Jordan River Basin was more than 1,000 years ago. Although we are still unable to accurately predict earthquake activity, a study of the frequency of quakes for this region suggests a rather large seismic event (up to 7.0 on the Richter Scale) could be expected in the future. Recent studies of earthquake preparedness along the Wasatch Front have shown local building codes inadequately address the potential for ground-shaking, and predict extensive property damage and loss of life in a major event. The basin's reservoirs, however, have been designed to withstand the shaking produced by a 7.0 earthquake and are expected to maintain their integrity despite sustaining some damage in such an event. It is likely that in the event of a major earthquake, localized flooding will occur because of ruptured canals and aqueducts.

13.3 Organizations and Regulations

13.3.1 Local

As a result of flooding in 1952, the Utah Legislature passed a law giving counties the responsibility for flood control operations. This responsibility was expanded in 1961 with the ability to levy taxes for flood control operations, bond for capital flood control improvements, and to establish special flood control districts. Salt Lake County Flood Control, a division of the Salt Lake County Public Works Department, has rights-of-way or clear title over most of the major streams within the county. Local cities and towns are responsible for planning and controlling runoff within city limits and outside of the county flood control's right-of-way. Their efforts, however, must comply with the county's flood control criteria.

13.3.2 State

The Division of Comprehensive Emergency Management (CEM), a division of the Department of Public Safety, is responsible for generating interest and developing emergency response and management plans. Under direction of CEM, towns, cities and counties prepare emergency response and

management plans that are comprehensive in scope but allow for effective and close cooperation with state and federal agencies in the event of a major disaster beyond local capabilities. CEM also works closely with other state and federal agencies to assure needed manpower, equipment, materials and supplies reach the disaster areas.

The initial response to a natural disaster is the responsibility of the impacted city or county. Other agencies involved after the initial response and in the long-term management of a natural disaster have the responsibility to work within established procedural guidelines and organizational structures. These guidelines have been developed to assure needed help and assistance is rendered in a timely and effective manner. Other agencies and officials involved in emergency response include the Governor's Office and the heads of all state divisions and departments.

13.3.3 Federal

The federal government provides assistance in disaster response, recovery, preparedness and mitigation through the Federal Emergency Management Agency (FEMA). Following a natural disaster, FEMA assistance commences with a Presidential Declaration of Disaster. The presidential disaster declaration generally follows a request from the governor for federal assistance. A federal disaster declaration provides the state with financial assistance from the federal government, along with FEMA personnel experienced in handling various aspects of disaster response, recovery and mitigation. The *Federal Response Plan* (FRP) is set up to provide technical assistance in the following 12 emergency support functions: transportation, communications, public works and engineering, fire fighting, damage information, mass care, resources, health and medical services, urban search and rescue, hazardous materials, food, and energy. One of the overriding principles in the FRP puts state and local leadership in charge while FEMA personnel fulfil a supporting role.

13.4 Flooding Problems

Because flows are regulated at the outlet from Utah Lake, flooding has not been a significant problem along the main stem of the Jordan River. Recent history, however, has given Salt Lake County residents cause for alarm along several of the Jordan River's tributaries. Record snowpack and spring

runoff in 1983 and 1984 resulted in numerous occurrences of local-flooding, landslides and mud-flow problems throughout the valley and in particular along the Wasatch Front streams on the east side of the valley. Also, the rising level of the Great Salt Lake, caused by record runoff from 1983 to 1986 resulted in many millions of dollars in damages to Salt Lake County residents.

No single entity has sole authority for flood control management activities. Cities and counties have the necessary statutory authority to act, but at least six other state and federal agencies also have some degree of authority and responsibility. The state's emergency response and hazard mitigation coordination authority rests with CEM. Hazard mitigation planning is usually provided by the state hazard mitigation team following flood emergencies. Pre-emergency planning is also often conducted. CEM assists the county in maintaining their preparedness plans.

Thunderstorms are common during the summer and fall months. These produce localized cloudburst flooding. Although the total volume of water produced by these storms is comparatively small, the instantaneous and localized runoff rate can be high. Damage from thunderstorms most often takes the form of erosion and sediment transport and deposition. Significant landslides and mud-flows can also result from these storms. Typically, these events occur along the hillsides or at the canyon mouths and adjacent residential developments.

13.5 Drought Problems

Droughts do not pose as great a threat to life and property as floods. Droughts generally are more of a nuisance than a natural disaster. This is primarily because existing reservoirs make it possible to provide water for essential life functions throughout the period of drought. The industry most impacted by drought is the agricultural community. Ironically, the agricultural community usually has the senior water rights. In periods of extreme drought, when all users are required to cut back on water consumption, the farmer can suffer significant financial losses if not total crop failure. Another water use significantly impacted by drought is the wildlife and waterfowl management areas adjacent the Great Salt Lake. These water users are located at river's end and have come to rely heavily upon return flows as well as the natural flow of the river. Water shortages can result

in disease and death for significant numbers of waterfowl and wildlife.

The municipal area's have weathered the recent periods of drought fairly well. This has been primarily because existing culinary supplies exceed the current demand and water purveyors have been willing to share surpluses. However, in 10 to 15 years, as the demand approaches the available supply, droughts will pose a much greater threat to the municipal community.

13.6 Other Water-Related Emergency Problems

Other disasters can impact water supplies. These generally are more localized in nature than flooding and drought. Included are such things as structural failure of water supply facilities (i.e. dams and aqueducts), toxic spills, landslides and earthquakes.

13.6.1 Toxic Spills

Toxic spills are most likely to occur along major highways such as I-15 and I-80, or along one of several railroad lines. This somewhat limits the potential for a toxic spill to threaten existing water supplies. Probably the greatest threat imposed by a toxic spill is the possibility of localized groundwater contamination. Groundwater contamination can be hard to detect, hard to quantify and difficult to clean up. For more on this subject, see Groundwater, Section 19. Any type of toxic spill into a river system can have a significant impact upon the waterfowl management areas along the shores of the Great Salt Lake.

13.6.2 Earthquakes

The Jordan River Basin, along with the entire Wasatch Front, is especially vulnerable to the effects of earthquakes. This is not only because of the high earthquake potential associated with the Wasatch Fault, but also because state and local building codes and construction methods do not reflect the high earthquake potential of the area. The Dam Safety Section of the State Engineer's Office (See Section 7 for more details) has been and still is monitoring and inspecting all of the state's high hazard dams. High hazard dams are those whose failure would threaten loss of life and/or significant property damage.

Another threat imposed by earthquake is the potential rupture of the Jordan Aqueduct, the Salt Lake Aqueduct, or both. Such a failure would cause

local flooding in the immediate area of the rupture and loss of culinary water supplies for several weeks to many months. Structural damage to one or more of the valley treatment plants would have a similar effect. Severe ground shaking throughout the valley could result in numerous local breaks to water lines, again resulting in local flooding followed by potentially long periods of water shortages.

Another potential problem is ground subsidence in the northwest part of the valley in and around the airport and the Rose Park area. Geologic studies of the area show the potential for ground subsidence of several feet in the presence of severe ground shaking. Such an occurrence could result in the intrusion of Great Salt Lake waters into the area.

13.6.3 Landslides

Landslides are most likely to occur along the foothills of the Wasatch Range or up one of the many canyons. Landslides can cover streams and/or canals resulting in immediate flooding to areas upstream of the slide. Following such an event, there is also the threat that impounded water will overtop and wash out the slide material and result in severe flooding to areas immediately downstream.

13.7 Flood Prevention and Hazard Mitigation

Flood hazard mitigation includes structural and non-structural activities that either eliminates or greatly reduces the impacts of flooding. Examples of structural mitigation measures include debris basins, dams, levees, various types of control structures and pipelines. Examples of non-structural mitigation activities are flood forecasting, zoning, flood plain protection and flood insurance. To be effective, flood hazard mitigation activities should be completed prior to the occurrence of a disaster. Flood hazard mitigation can also be thought of as a post-event activity. Managing agencies should use the lessons learned from recent events to prepare for and mitigate against possible recurrence. Utah's unprecedented floods of 1983 resulted in damages of nearly \$500 million, much of it in the Jordan River Basin. Higher flows in 1984, however, amounted to only about one-sixth of those experienced in 1983. This was due in part to the mitigation efforts conducted after the 1983 event and prior to the 1984 flood. In just one year, the mitigation improvements prevented damages that far exceeded planning and construction costs.

13.7.1 Forecasting

Peak flows in the Jordan River and its tributaries occur in the spring of the year and are primarily a function of snowmelt and runoff. These events can be forecasted with a fair degree of accuracy by monitoring the snow survey data. Forecasts can, in turn, be used to initiate flood preparations such as sandbagging. This process of forecasting and pre-flood preparations worked well to mitigate a great deal of potential flood damage in 1984 and 1986.

13.7.2 Flood Plain Zoning and Flood Insurance

One of the most effective methods of mitigating or minimizing the effects of future flooding is through creation of and strict adherence to a flood plain zoning plan. County and city governments should work through the state Community Assistance Program of the National Flood Insurance Program to evaluate flood hazard maps of identified flood plains, and to enact appropriate zoning regulations to prevent further encroachment and thereby reduce the potential for flood damages. Most communities already have current maps and ordinances. In additional areas where national flood insurance can be made available by the adoption of the associated flood plain standards, local governments should attempt to do so. Also, public education and promotion of flood awareness would be beneficial.

Salt Lake County and the various communities throughout the valley should be aggressive in regulating and limiting the construction of inappropriate and expensive developments in flood plains. Experiences nationwide have shown that when residential and commercial development takes place in the floodplain, catastrophic flooding leads to serious injuries, loss of life and significant economic impacts. The development of parks, golf courses, wetlands, wildlife preserves and other such uses within the flood plain can, however, be a beneficial use of those lands.

As a protection against monetary losses when flooding occurs, the National Flood Insurance Program is effective in areas where it is available. The Federal Emergency Management Agency (FEMA) has identified special hazard areas with flood insurance rate maps. Zoning and flood hazard reduction regulations have been adopted by these communities to direct future construction to minimize flood damage. A key benefit from local adoption of the floodplain standards has been the availability of

flood insurance through private companies at reduced rates.

13.7.3 Watershed Protection

Prevention is usually more cost-effective than damage repair and mitigation. Flooding can be significantly reduced by maintaining and protecting watershed vegetation and/or by building watershed flood storage. The Soil Conservation Commission, in conjunction with the Natural Resources Conservation Service and the Salt Lake Soil Conservation District, should continue its practice of re-evaluating the potential for small watershed projects in the Jordan River Basin.

Wildfires during dry summer months can significantly damage vegetation and greatly increase the potential for high runoff and debris flows. The occurrence of wildfire disasters should be quickly followed by efforts to mitigate against the increased flooding potential.

13.7.4 Flood Control Structures

The flow of the main stem of the Jordan River is controlled by releases from Utah Lake. Reservoirs above Utah Lake provide additional controls. Consequently, the potential for flooding along the main stem of the Jordan River is very low. The tributary streams of the Jordan River, however, have few controls. Parley's Creek has flood storage capacity in Mountain Dell and Little Dell reservoirs. Red Butte Reservoir, although currently being considered for removal, still offers limited flood storage capacity on Red Butte Creek. Big and Little Cottonwood canyons and Bells Canyon have a number of small ponds. But these are, for the most part, quite high in their respective drainages and relatively small, rendering them rather ineffective as flood control structures.

The county has routed several streams through retention basins such as the one in Sugarhouse Park on Parley's Creek and the one in Liberty Park where the flows from Parley's Creek, Emigration Creek, and Red Butte Creek come together. These retention basins are designed to attenuate the floods so that downstream pipes can adequately handle the outflows. The same approach is taken throughout the valley with numerous retention basins built to attenuate storm runoff from new commercial and residential developments. Many of these retention basins have been put to dual use being lined with

grass and used regularly as parks and playground areas. This approach has worked well for the county and undoubtedly will continue to be the planning approach for future developments. Since the flooding of 1983, the county has also built mud and debris flow basins at the mouths of several canyons.

13.7.5 Improved Stream Channel Capacity

In the past, improving stream channel capacity has meant channel widening, straightening, dredging and/or concrete or riprap lining. Today's more environmentally sensitive society, however, requires that flood control planning be only part of a more holistic approach to stream management. Flood courses are seen by many as valuable riparian areas and corridors of wildlife habitat within the increasingly developed urban areas. Consequently, increasing stream channel capacity must be accomplished in a way that is sensitive to these other interests.

Due to relatively high sediment loads, slow velocities and raw stream banks, the lower Jordan River (below 2100 South) has required almost continual dredging to maintain flow capacity. If sediment loads cannot be controlled, then maintaining the flow capacity of this portion of the Jordan River will most likely mean continued dredging of the channel. At the current time, however, there are plans to spend a considerable amount of money as a part of the Central Utah Project wildlife mitigation efforts to rehabilitate the Jordan River. The habitat improvement and channel capacity issues need to be planned for in a cooperative way so as not to be counterproductive.

13.7.6 Jordan River Meander Corridor

Salt Lake County passed an ordinance in 1994 establishing a Jordan River Meander Corridor. The ordinance defined the boundaries of the Jordan River's natural meander pattern, and set limits on the types of development and land uses that can occur within the designated corridor. This effort follows closely on the heels of the county's *Jordan River Stability Study*, published in December 1992. That study defined the Jordan River as "... continually undergoing the processes of bank erosion, long-term channel bed degradation, bridge scour, sediment deposition and meander migration." The river's flood potential is directly related to the natural erosion and sedimentation processes as a part of the river's natural

dynamics. In order to better provide for the protection and use of the Jordan River channel for storm drainage and flood control, it is necessary and desirable to adopt a county-wide management plan designed to promote greater channel stability within the flood channel corridor.

Many of the cities that border the Jordan River (Salt Lake City, Midvale, West Valley City, Taylorsville, West Jordan, Riverton and Bluffdale) are developing their own management plans for the Jordan River within their city boundaries. Many of these city plans include the establishment of parkways and trails, not merely to address flooding concerns but also to resolve environmental and recreational issues. It is important that these cities' planning efforts are well coordinated, with each other, and with the county's effort to establish a meander corridor.

13.8 Drought Reduction Alternatives

In contrast to flooding, which tends to be more local in extent, drought is most often basin-wide, regional or statewide. Therefore, it has been dealt with in the past on a statewide basis. A drought response plan has been prepared and is now in place to provide an effective means for the state of Utah to assess and respond to drought impacts. The plan came into being as a result of experience gained during the severe drought of 1977.

13.9 Other Emergency Alternatives

The "other" water-related emergency problems described in subsection 13.6 are local in nature. Communities should have a disaster response plan. First response to any disaster should take place at the local level. Before any city, town or county appeals to the state or federal government for assistance, it should be certain that the event is beyond its capacity to handle the emergency. Local governments should develop disaster response plans with assistance from the Division of Comprehensive Emergency Management and they should be coordinated with neighboring communities.

13.10 Issues and Recommendations

The following recommendations deal with reducing damages from floods in the Jordan River Basin through studies, projects, management and regulations.

13.10.1 Flood Plain Management

Issue: Local governments need to be aware of their responsibilities as it relates to flood plain management and the National Flood Insurance Program.

Discussion: The National Flood Insurance Program (NFIP) was established by Congress in 1968 as a result of large federal outlays for structural measures and disaster relief. Its purpose is to reduce flood losses, prevent unwise development in flood plains, and provide affordable flood insurance for the public. Local entities should conduct education programs on flood hazard awareness and the benefits of participation in the NFIP.

Twelve separate participating NFIP communities are located in the basin. Approximately 436 policies are in force with a total dollar coverage of approximately \$34,269,800. A community agrees to enact and enforce minimum flood plain management requirements as stated in the *Code of Federal Regulation* (CFR), part 60.3. In exchange for enforcing these regulations, flood insurance is made available within the participating community. These regulations apply to new construction and substantial improvements.

The Division of Comprehensive Emergency Management is the state coordinating agency for the NFIP. The office can assist local participating communities in the implementation of the flood plain management objectives defined by the NFIP.

The Corps of Engineers, through its Flood Plain Management Program, also can develop flood plain boundary maps at no cost for those communities which need one or update those which do not adequately reflect current conditions

Recommendation: Non-participating local entities should become qualified to participate in the National Flood Insurance Program. The Division of Comprehensive Emergency Management should identify the communities not participating in the (NFIP) and meet with them in an effort to help them qualify for the program.

13.10.2 Disaster Response Plans

Issue: Not all communities have a disaster response plan.

Discussion: Local governments need to increase their ability to respond to natural disasters and emergencies. Emergency Operations Plans (EOPs), also referred to as Disaster Response Plans, address

disaster response and recovery activities following a disaster. These plans should be prepared ahead of time allowing counties, cities and towns to coordinate efforts and define responsibilities. Decisions regarding leadership should be made and the process for the activation of response activities should be outlined.

The Division of Comprehensive Emergency Management has the statewide responsibility of planning for, responding to, recovering from and mitigating emergencies. This agency has developed statewide plans for disaster response, and it can assist local entities prepare response plans for emergency situations.

Recommendation: Local communities should develop disaster response plans with the assistance of the Division of Comprehensive Emergency Management. ■